

one of the substances in combination or mixture to be separated. Petrovich does not disclose a chemical reaction that alters the molecular structure of any molecules in the combination or mixture (mineral slurry). In column 2 line 60 to column 3 line 12 of Petrovich it explains that the reaction is only on the surface of the mineral and the attachment is not a molecular or atomic bond but a surface adsorption bond. Petrovich cannot be used as anticipation prior art because no chemical reaction altered the molecular structure of any substance in the combination or mixture that is to be separated.

C. Patents McCarry, Bulatovic et al., Bornengo et al. and Horowitz et al. are all froth flotation examples. The Examiner did not state a specific relevance to the invention claimed or that the references anticipated the invention claimed. These references are not relevant to the invention claimed because froth flotation does not require an alteration of a molecular structure of substance in a combination or mixture by an organic chemical reaction. The slight exception to this is the reference Horowitz et al. that does explain an organic chemical reaction that alters the molecular structure. The Examiner did not make any specific comments of this patent and did not state what relevance it might have to the invention claimed. The Applicant states that Horowitz et al. does show an actual organic chemical reaction that does alter the molecular structure of a substance, but there is a difference. The organic chemical reaction is actually the separation of the sulfur atoms atomically bonded with the coal. This sulfur separation is done after the froth flotation is used, and the organic chemical reaction that alters the molecular structure is not done to benefit the froth flotation method of separation. The organic chemical reaction is actually where the separation occurs. In Horowitz et al., the organic chemical reaction actually frees the sulfur from the coal without any real mechanical method of separation. The organic chemical reaction in Horowitz et al. effectively causes an atomic bond separation between atoms of sulfur and molecules of coal. The simple washing can be technically interpreted as a mechanical means of separation, but the Applicant had intended something more substantial as the mechanical means of separation.

This type of separation by an organic chemical reaction is not what the Applicant intended and is not within the scope of the invention claimed. The Applicant is not claiming an invention that uses an organic chemical reaction to separate substances that are atomically bonded together. The Applicant is claiming an invention that uses an organic chemical reaction to alter both the molecular structure and a physical characteristic of a substance that is in a non-atomic bond combination or mixture to then make it possible to use a mechanical means of separation. The Applicant has now tried to amend the claims to accurately reflect the scope of the invention.

An example of the invention claimed would be to have two substances with the same or very close to same, specific gravity. This fact would make it impossible to use specific gravity flotation separation as a method to separate these two substances. This problem can be overcome by using an organic chemical reaction to alter the molecular structure and also the specific gravity (physical characteristic) of one of the two substances. Then the specific gravity flotation separation can be used to successfully separate one substance from the other. This is the scope of the invention claimed, and the claims have been amended to reflect that the invention does not seek to separate substances that are

atomically bonded together. However, the invention does seek to separate substances that are in a combination or mixture without any chemical bonds such as waste paper from the other trash or, separate substances that have intermolecular bonds. An intermolecular bond example is the separation of lignin and cellulose from the lignin-cellulose molecular matrix. Lignin and cellulose are bonded in crystalline matrix of intermolecular hydroxide bonds (OH-OH). The secondary ramification of the invention claimed is that the use of certain organic chemical reactions can alter the molecular structure of cellulose so that it no longer has an intermolecular bond with the lignin. The lignin is mechanically separated from the cellulose by a liquid-solid drainage separation. This ramification of the invention claimed is different from the patent Rachor et al. Rachor et al. patent number 3,912,706 reacts lignin, already separated from the cellulose, with different compounds to obtain effective flocculating agents. I cannot find an actual separation in this patent document. The Examiner gave no comments on how this patent would be relevant to the invention claimed.

Schneider patent number 4,066,505 is relevant prior art for the invention claimed. The Examiner states that the Schneider reference anticipates the invention claimed. Schneider claims an invention process that extracts a polypeptide from an aqueous solution. The process uses "a water-soluble macromolecular complex (I) of macromolecules covalently bonded to molecules of at least one compound capable of fixing the polypeptide in a selective, reversible and non-destructive manner, is selectively reacted with the polypeptide by forming in solution a complex (II); and the complex (II) is separated from the solution and dissociated into polypeptide molecules and complex (I) molecules, and the polypeptide is isolated."

Schneider does have an organic chemical reaction that alters both the molecular structure and the molecular size. Then the altered polypeptide is put through a specified semi-permeable membrane and this ultra-filtration is the mechanical means of separation in the Schneider process. Schneider contains several elements in the claimed process that are quite narrow under any interpretation.

The first narrow element in Schneider is that only a polypeptide or an enzyme is extracted or separated. A polypeptide is defined in Webster's Dictionary as "any combination of several amino-acid molecules." An enzyme is defined in Webster's Dictionary as "one of a large class of proteinaceous substances of high molecular weight formed in and produced by living matter which are responsible for promoting the chemical reactions upon which life depends (e.g. digestion, respiration, reproduction). They accomplish this by acting like a catalyst while themselves undergoing little or no change. Their action is often specific and reversible and may be dependent upon temperature, pH, and the presence of various coenzymes and activators." Nor does Schneider suggest that anything other than a polypeptide or an enzyme can be separated with the process disclosed in Schneider. There are at least two places within the Schneider patent document where the inventor had the perfect opportunity to state the ability of the disclosed invention to separate anything else besides just a polypeptide or an enzyme. The first opportunity occurs in column 2 line 49 to line 58 "The expression "crude extract" is understood to mean an aqueous solution containing, in addition to the enzyme or enzymes it is desired to extract, other proteins, nucleic acids, metabolites, mineral salts, polysaccharides, and many other inorganic and organic substances. "Crude

extracts" from any source may be used, in particular those which are obtained, in a manner known per se, from microorganism culture after breaking down the cells and extracting proteins, or from animal tissue homogenates, or from plant extracts." Here the inventor states both the highly specific and highly general substances (inorganic and organic) that can be in the aqueous solution or crude extract but does not suggest that any of these substances can be separated using the Schneider process. The second opportunity is in column 8 line 55 to 62 the conclusion paragraph before the claims are stated. "It should be noted that although the preceding description only gives examples of the use of the process according to the invention for the extraction of enzymes or polypeptide enzyme inhibitor from an aqueous solution, this process may also be used to extract other types of polypeptides, in particular antibodies or antigens, polypeptide hormones such as insulin, proteins such as albumin, glycoproteins and lectins." All the substances listed are types of polypeptides and the inventor had the clear opportunity to list any other substances that the process could separate. The benefit of a broader patent would have been advantageous for the inventor but the limitations of the process prevented the inventor from even suggesting separating the other materials. The Schneider process can only separate an enzyme or a polypeptide but the present invention claimed by the Applicant can separate inorganic and organic substances other than polypeptides or enzymes. Schneider does not anticipate separating plastic or lignin from cellulose.

The second narrow element in Schneider is that separation can only be done from an aqueous solution. The aqueous solution or "crude extract" is defined in the previous paragraph quoted from Schneider. The inventor, once again, has ample opportunity to suggest in the patent document that the process can be used to separate a polypeptide or an enzyme from other than an aqueous solution. The process limitations prevent the inventor from making such a suggestion. Schneider mentions prior art that "contacts the crude extract directly with a solid substance such as cellulose or a synthetic resin to which are covalently bonded molecules of a specific inhibitor for this enzyme, and then eluting the enzyme." There is perfect opportunity for Schneider to suggest the reverse could be done using the enzyme to bond with the cellulose or synthetic resin to separate out the solid cellulose or solid synthetic resin from a solid mass or an aqueous solution. The inventor cannot do this because it is physically impossible to use the process in this way, and therefore the inventor makes no suggestion that the process operates outside an aqueous solution. Schneider makes no suggestion that waste paper could be separated from other trash or that lignin could be separated from cellulose. The present invention claimed by the Applicant can do both.

The third narrow element in Schneider is that a water-soluble macromolecule bonded to a compound capable of fixing the polypeptide must be used. This is very specific and a very narrow element that is stated in the abstract, specification, and claims of Schneider. The element would not be stated in such highly specific terms if it were not necessary for it to be that narrow and specific for the invention to operate properly. The macromolecule covalently bonded to molecules of at least one compound capable of fixing polypeptide is needed to increase the size of the polypeptide or enzyme molecule. Macromolecule means big molecule in terms of size as does molecular weight. Molecular weight is different from the actual weight of substance. Specific gravity or density is more indicative of the weight of a substance than is the molecular weight. This demonstrated

by column 7 line 1-3 " through an ultra-filtration membrane which allows only molecules having a molecular weight below 50,000 to pass through." The present invention claimed does not require a specific reagent, much less one that is so extremely specific. The fact that the reagent must be water-soluble means they may not always be re-useable. This would not be beneficial for most industrial applications to have a reagent built to be easily broken down instead of one built to be re-used under most conditions, even in water. The Schneider process obviously cannot operate with a reagent that is designed to have a magnetic attraction, a high specific gravity, low specific gravity, or a reagent that reduces the number of atoms of a polypeptide or an enzyme. This is a very narrow element in the Schneider process, and there is no suggestion to alter or open up the choices of reagent to other things beside the macromolecular complex stated.

In Schneider, certain elements are broad such as the manner in which the macromolecular complex fixes to the polypeptide and the mechanical method of separation is not limited to using ultra-filtration. This demonstrates that the inventor can broaden an element when the inventor has foreseen the possibility and the process allows for it. The fourth narrow element in Schneider is that the reagent is "capable of fixing in a selective, reversible and non-destructive manner, is selectively reacted with the polypeptide in the solution to fix the polypeptide by forming in solution a complex (II)." The capability of a reagent to be selective is necessary for separation process to operate. To be reversible is beneficial for most industrial applications, but on occasion it might be unnecessary for the reaction to be reversible. For instance, if the contaminants are in the mixture in small amounts then simply bonding a heavy compound to them that is not reversible might prove to be more economical. Instead of reversing the reaction to recover the small amounts of reagent and a non-usable contaminant, it might be more economical to just dispose of the combined material. The idea is to leave the option open so the industry can choose the overall best option. Schneider does not leave the option open with this and the other narrow elements.

The fifth narrow element in Schneider is that the reagent is fixed to the polypeptide in a non-destructive manner. This is normally a good idea for industrial applications like the reversibility mentioned in the previous paragraph, but it is still too restrictive under some circumstances. For instance, if reversing the reaction is too costly or the contaminant is so small that it is more economical to dispose of it, then the destruction of the contaminant is a beneficial option. Another example is a contaminant such as PVC in the PET recycling stream can be altered destructively and irreversibly to remove the chloride from the PVC. This would significantly alter the specific gravity of the PVC and would allow the altered PVC to be separated from PET using specific gravity flotation. This is not currently possible because PET and PVC have almost the same specific gravity range. Operating a separation process in this manner is not possible or suggested by Schneider. The present invention claimed discloses such a separation.

The sixth narrow element is that the organic chemical reaction must include a polypeptide or an enzyme. This restricts the Schneider process from using an organic chemical reaction on other substances that might turn up in the crude extract. What happens if there is a substance in the solution that will decompose the filtration membranes or that might clog the membranes? Removing the substance may require using an organic chemical reaction to alter a physical characteristic that might neutralize,

remove, or decompose this substance. Then the Schneider process could be used on the polypeptide. The present invention claimed is not restricted by such a narrow element or elements and as such is a far superior process.

The mechanical method or means of separation seems to be non-specific in Schneider based on the statement at column 4 line 46 – 57. At column 4, line 39 and column 4, line 46-47 the phrase “ any suitable procedure may be adopted” is used to broaden the element. At column 4 line 60-61 the phrase “ any suitable procedure which is known per se may be used” is also used to broaden the element. This demonstrates, once again, that the inventor does broaden the elements whenever it is possible and foreseen to do so.

The 6 narrow elements the Applicant has described were not broadened in the abstract, specification, or the claims of Schneider. The reason for this is that the process disclosed in Schneider is limited by the actual physical reality that the process cannot operate outside these narrow elements. Therefore, the inventor does not suggest any possibilities that the process could operate outside these 6 narrow elements because Schneider does not foresee the possibilities that it can operate outside these 6 narrow elements.

The combination of the 6 narrow elements contained in the process disclosed in Schneider severely restricts the process with regards to prior art by any interpretation. The Schneider process must separate a polypeptide or an enzyme from an aqueous solution by fixing a water-soluble macromolecular complex to the polypeptide or an enzyme in a reversible and non-destructive manner. The best embodiment of the present invention claimed disclosed a process that separates paper (cellulose) from plastic in the solid waste stream that is in a solid mass by bonding a high density substance to the paper. Thus altering the specific gravity of the cellulose so that the mechanical method of specific gravity flotation can be used to separate the paper from the plastic in the solid waste stream. These steps are just one of many examples of the multiple modifications that are not suggested by Schneider. Indeed the modifications would be impossible for Schneider. Therefore, the Applicant concludes that Schneider does not anticipate the present invention claimed by the Applicant, and that the present invention claimed by the Applicant is not obvious with regards to the prior art contained in Schneider.

The Applicant has amended the claims below to better describe the present invention claimed with regards to the atomic bonds in Horowitz and to ensure that the claims are both novel and unobvious in light of Schneider. The Applicant is clearly stating in the new claims that a polypeptide, or an enzyme are not substances to be reacted with in the present invention claimed. The Applicant is clearly stating in the new claims that the method does not claim separation of substances that are atomically bonded together. Petrovich does not use an organic chemical reaction to alter the molecular structure and alter a physical characteristic of substance **within** a combination or mixture. Petrovich is not relevant prior art for the present invention claimed.

The modification of separating substances from either an aqueous solution or a non-aqueous solution is a beneficial modification not suggested by Schneider that makes the present invention claimed superior to Schneider as a separation process. The modification of bonding substances other than a water-soluble macromolecular complex is a beneficial modification not suggested by Schneider that causes the present invention claimed to be superior to Schneider as a separation process. The modification of reacting with other substances beside a polypeptide or an enzyme is a beneficial modification not suggested

by Schneider that causes the present invention claimed to be superior to Schneider as a separation process. The modifications of an organic chemical reaction that can be reversible and can be destructive are beneficial modifications not suggested by Schneider that causes the present invention claimed to be superior to Schneider as a separation process. The claims of the present invention have been amended to exclude a polypeptide or an enzyme from being separated or reacted with. These facts render the present invention claimed to be novel and unobvious with regard to Schneider.

The present invention claimed has new and unexpected results not suggested in Schneider or other literature. In fact, the new and unexpected results cannot be attained using Schneider in theory or practice. Schneider in theory or practice cannot separate paper (cellulose) from trash. Schneider in theory or practice cannot separate lignin from cellulose. Schneider in theory or practice cannot separate anything from a solid or gaseous mass. Schneider in theory or practice cannot separate anything by reducing the size of a molecule. Schneider in theory or practice cannot separate anything by adding a magnetic element or compound to a molecule. To use an organic chemical reaction to alter the molecular structure and alter a physical characteristic of a substance (such as specific gravity, magnetic attraction or break apart an intermolecular bond) that will allow a mechanical method of separation is not expected by Schneider or other literature on separation. There are many more aspects of the present invention claimed that yields new and unexpected results not foreseen by Schneider or other literature.

The best embodiment of the present invention claimed seeks to solve a different problem than the prior art of Schneider. Schneider never seeks to separate a solid substance from a solid mass. In fact, the present invention claimed goes against what Schneider teaches in this regard. Schneider teaches separation from an aqueous solution only, while the present invention claimed teaches separation from a solid mass, aqueous solution and a gaseous state of matter.

The Applicant thinks it may be possible to find a heavy bio compound to fix to a polypeptide or an enzyme that would alter the specific gravity of the polypeptide or an enzyme so separation could be done with specific gravity flotation. If possible, it is an advantage of the invention that Schneider or others ever appreciated. The Schneider patent was granted and became public on January 3, 1978, so others have had over 25 years to take any teachings from Schneider and implement them. If the information contained in Schneider had rendered the present invention claimed as obvious because of the benefit and advantages, those skilled in the art surely would have implemented it by now. That is, the fact that people skilled in the art have not implemented the invention, despite its great advantages, indicates that it is not obvious.